

EMI TEST REPORT

Test Report No. : 26HE0100-HO-C-1

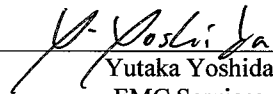
Applicant : Hitachi Maxell, Ltd.
Type of Equipment : Digital Pen
Model No. : DP-201
Test standard : FCC Part 15 Subpart B Class B 2006
Test Result : Complied

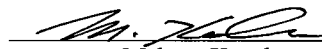
1. This test report shall not be reproduced in full or partial, without the written approval of UL Apex Co., Ltd.
2. The results in this report apply only to the sample tested.
3. This equipment is in compliance with the above regulation. We hereby certify that the data contain a true representation of the EMC profile.
4. The test results in this report are traceable to the national or international standards.
5. This test report does not constitute an endorsement by NIST/NVLAP or U.S. Government.

Date of test:

March 17 to April 11, 2006

Tested by:


Yutaka Yoshida
EMC Services


Makoto Kosaka
EMC Services

Approved by :


Naoki Sakamoto
Group Leader of EMC Services



This laboratory is accredited by the NIST/NVLAP, U.S.A.
The tests reported herein have been performed in accordance with its terms of accreditation.

*As for the range of Accreditation in NVLAP, you may refer to the WEB address, <http://ulapex.jp/emc/nvlap.htm>

UL Apex Co., Ltd.

Head Office EMC Lab.

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MF060b(19.04.06)

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SECTION 1: Client information

Company Name : Hitachi Maxell, Ltd.
Address : 6139-1 Ohnogo, Mitsukaido-shi, Ibaraki 300-2595 Japan
Telephone Number : +81-297-24-1203
Facsimile Number : +81-297-24-1701
Contact Person : Shigeru Sakairi

SECTION 2: Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment : Digital Pen
Model No. : DP-201
Serial No. : AJX-AAB-H2Z-AE
Rating : DC3.7V (Lithium Ion Rechargeable Battery),
DC5.0V, 0.15A (EUT with Cradle for Charging mode)
Country of Manufacture : China
Receipt Date of Sample : March 16, 2006
Condition of EUT : Production prototype
(Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT : No modification by the test lab

2.2 Product Description

	Details
Clock frequency	MPU: 16MHz, BT LSI: 16MHz, RTC: 32.768kHz
Feature of EUT	Digital Pen, model: DP-201 can convert analog information such as hard-written letters and drawings on a special sheet of paper, on which invisible dot pattern are printed, into digital information, and can store such digital information into its embedded memory. The digital pen can interface with PC and other computer devices, and transmit the stored digital information through Bluetooth and USB.
Equipment Type	Transceiver
Frequency of Operation	2402-2480MHz
Bandwidth & Channel spacing	79MHz & 1MHz
Type of Modulation	FHSS
Antenna Type	Inverted-F
Antenna Connector Type	Soldering
Antenna Gain	0.69 dBi max
ITU code	F1D
Power Supply	DC 3.5-4.2V
Operating temperature	0 to 40 deg.

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SECTION 3: Test specification, procedures & results

3.1 Test specification

Test Specification : FCC Part 15 Subpart B 2006
Title : FCC 47CFR Part15 Radio Frequency Device
Subpart B Unintentional Radiators

3.2 Procedures and results

Item	Test Procedure	Limits	Deviation	Worst margin *0)	Result
Conducted emission	ANSI C63.4: 2003 7. AC powerline conducted emission measurements	Class B	N/A	16.7dB 0.15590MHz, QP, N	Complied
Radiated emission	ANSI C63.4: 2003 8. Radiated emission measurements	Class B	N/A	0.3dB 479.968MHz, QP, Horizontal	Complied
*Note: UL Apex's EMI Work Procedure QPM05. *0) The result is rounded off to the second decimal place. Therefore, there may be 0.1 difference for the result.					

3.3 Uncertainty

Conducted Emission

The measurement uncertainty (with a 95% confidence level) for this test was ± 2.6 dB.
The data listed in this test report has enough margin, more than the site margin.

Radiated Emission

The measurement uncertainty (with a 95% confidence level) for this test using Biconical antenna is ± 4.59 dB(3m).
The measurement uncertainty (with a 95% confidence level) for this test using Logperiodic antenna is ± 4.62 dB(3m).
The measurement uncertainty (with a 95% confidence level) for this test using Horn antenna is ± 5.27 dB.
The data listed in this report meets the limits unless the uncertainty is taken into consideration.

3.4 Test Location

UL Apex Co., Ltd. Head Office EMC Lab. *NVLAP Lab. code: 200572-0

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	FCC Registration Number	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Other rooms
No.1 semi-anechoic chamber	313583	IC4247A	19.2 x 11.2 x 7.7m	7.0 x 6.0m	Preparation room
No.2 semi-anechoic chamber	846015	IC4247A-2	7.5 x 5.8 x 5.2m	4.0 x 4.0m	-
No.3 measurement room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.4 measurement room	-	-	4.0 x 6.0 x 2.7m	N/A	-
No.5 shielded room	-	-	6.0 x 6.0 x 3.9m	N/A	-
No.6 shielded room	-	-	4.0 x 4.5 x 2.7m	N/A	-
No.6 preparation room	-	-	4.75 x 5.4 x 3.0m	N/A	-
No.7 shielded room	-	-	4.7 x 7.5 x 2.7m	4.7 x 7.5m	-
No.8 measurement room	-	-	3.1 x 5.0 x 2.7m	N/A	-

* Size of vertical conducting plane (for Conducted Emission test) : 2.0 x 2.0m for No.1 and No.2 semi-anechoic and No.7 shielded room.

3.6 Test set up, Test instruments and Data of EMI

Refer to APPENDIX 1 to 3.

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SECTION 4: Operation of E.U.T. during testing

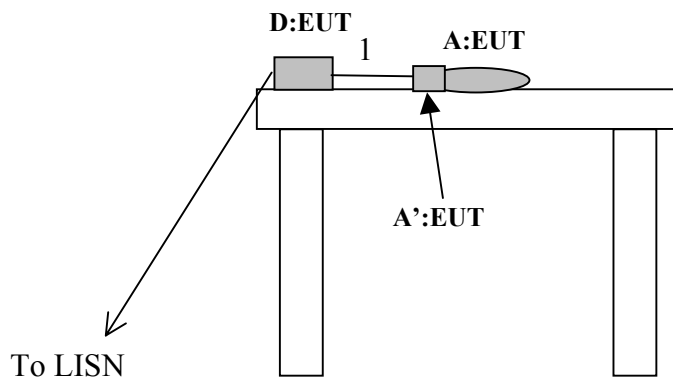
4.1 Operating Modes

The mode is used : [Conducted emission]
-Charging mode

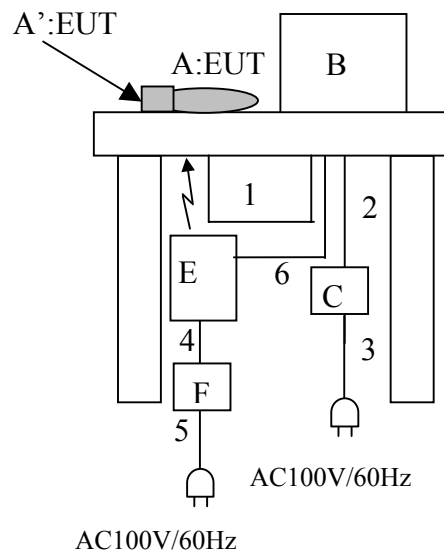
[Radiated emission]
Bluetooth communication mode

4.2 Configuration and peripherals

For Conducted emission



For Radiated emission



Description of EUT

No.	Item	Model number	Serial number	Manufacturer	Remark
A	Digital Pen	DP-201	AJX-AAB-H2Z-AE	NAMTAI	EUT
A'	Cradle	PC-201	-	NAMTAI	EUT
B	Note PC	Type 2647	97ALT8C	IBM	-
C	AC Adaptor	02K6750	11S02K6750A12UP29P05F5	IBM	-
D	AC Adaptor	PS-DP1	-	Hoshiden	EUT
E	Wireless development system	WDS 6.0	3037	Micro devices	-
F	AC Adaptor	EPA-201D-06	-	ENG ELECTRONICS CO., LTD	-

List of cables used

No.	Name	Length (m)	Shield
1	USB Cable	1.0	Y
2	DC Cable	2.0	N
3	AC Cable	1.0	N
4	DC Cable	1.0	N
5	AC Cable	2.9	N
6	R232C Cable	2.0	Y

SECTION 5: Conducted Emission

5.1 Operating environment

Test place : No.2 semi anechoic chamber.
Temperature : See data
Humidity : See data

5.2 Test configuration

EUT was placed on a urethane platform of nominal size, 1.0m by 0.5m, raised 80cm above the conducting ground plane. The rear of tabletop was located 40cm to the vertical conducting plane. The rear of EUT and its peripherals was aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80cm from the LISN/AMN and excess AC cable was bundled in center. They were folded back and forth forming a bundle 30cm to 40cm long and were hanged at a 40cm height to the ground plane. Each EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN/AMN to the input power source. All unused 50 ohm connectors of the LISN/AMN were resistivity terminated in 50 ohm when not connected to the measuring equipment.
A drawing of the set up is shown in the photos of APPENDIX 1.

*EUT was located 80cm from LISN/AMN and excess AC cable was bundled in center. I/O cables that were connected to the other peripherals.

5.3 Test conditions

Frequency range : 0.15 MHz-30MHz
EUT position : Table top
EUT operation mode : See Clause 4.1

5.4 Test procedure

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT within a semi anechoic chamber. The EUT was connected to a Line Impedance Stabilization Network (LISN)/ Artificial Mains network (AMN). An overview sweep with peak detection has been performed. The measurements have been performed with a quasi-peak detector and if required, with an average detector.

The conducted emission measurements were made with the following detector function of the test receiver.

Detector Type : Quasi-Peak and Average
IF Bandwidth : 9 kHz

5.5 Test result

Summary of the test results: Pass

Date: April 11, 2006

Test engineer: Makoto Kosaka

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SECTION 6: Radiated Emission

6.1 Operating environment

Test place : No.2 semi anechoic chamber
Temperature : See data
Humidity : See data

6.2 Test configuration

EUT was placed on a platform of nominal size, 1.0m by 1.5m, raised 80cm above the conducting ground plane.
The EUT was set on the center of the tabletop.
Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna was varied in height above the conducting ground plane to obtain the maximum signal strength.
A drawing of the set up is shown in the photos of APPENDIX 1.

6.3 Test conditions

Frequency range : 30MHz – 300MHz (Biconical antenna) / 300MHz – 1000MHz (Logperiodic antenna)
1 to 8GHz (Horn antenna)
Test distance : 3m
EUT position : Table top
EUT operation mode : See Clause 4.1

6.4 Test procedure

The height of the measuring varied between 1 and 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.
The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer (in linear mode).
The test was made with the detector (RBW/VBW) in the following table.
When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

Frequency	Below 1GHz	Above 1GHz
Instrument used	Test Receiver	Spectrum Analyzer
IF Bandwidth	QP: BW 120kHz	PK: RBW:1MHz/VBW: 1MHz AV: RBW:1MHz/VBW:10Hz

6.5 Test result

Summary of the test results: Pass

Date: March 17 and 18, 2006

Test engineer: Yutaka Yoshida

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APPENDIX 1: Photographs of test setup
Conducted Emission

Top

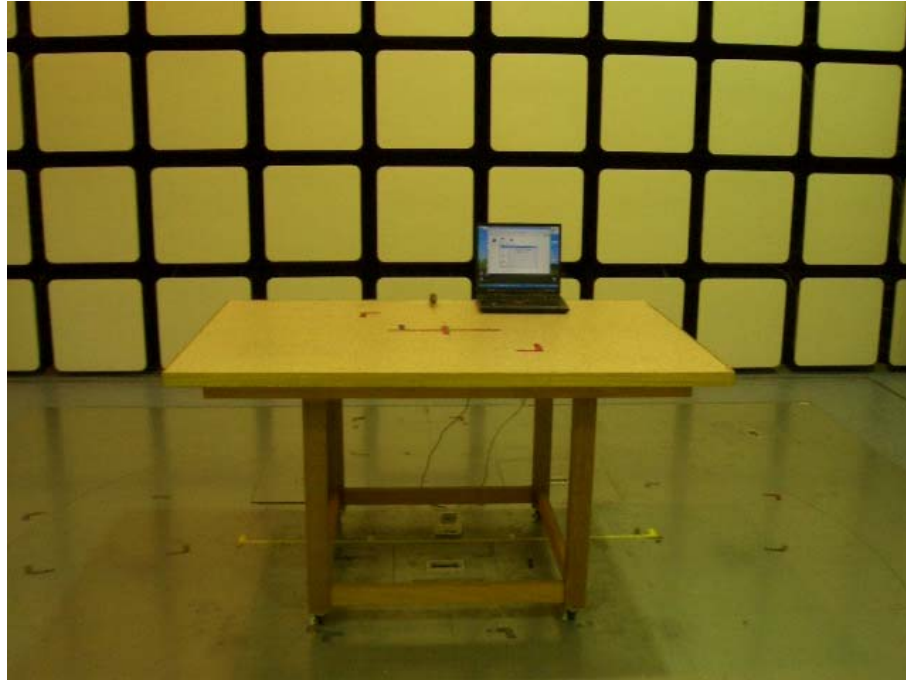


Side

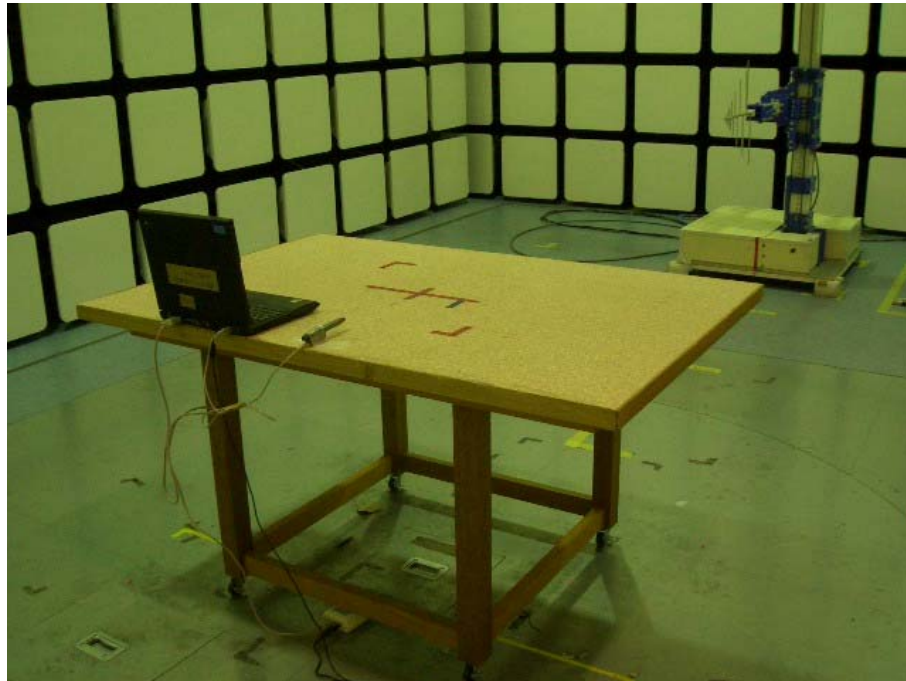


Radiated Emission

Front



Rear



APPENDIX 2: Test instruments

EMI Test Instruments

Control No.	Instrument	Manufacturer	Model No	Test Item	Calibration Date * Interval(month)
MOS-16	Thermo-Hygrometer	Custom	CTH-180	RE	2006/01/19 * 24
MHA-06	Horn Antenna	Schwarzbeck	BBHA9120D	RE	2006/01/09 * 12
MCC-16	Microwave Cable 1G-26.5GHz	Suhner	SUCOFLEX 104	RE	2006/02/02 * 12
MCC-47	Microwave Cable 1G-26.5GHz	Suhner	SUCOFLEX104	RE	2005/08/30 * 12
MPA-10	Pre Amplifier	Agilent	8449B	RE	2005/09/07 * 12
MRENT-26	Spectrum Analyzer	Advantest	R3273	RE/CE	2006/02/15 * 12
MBA-02	Biconical Antenna	Schwarzbeck	BBA9106	RE	2005/10/10 * 12
MLA-02	Logperiodic Antenna	Schwarzbeck	USLP9143	RE	2005/10/14 * 12
MPA-09	Pre Amplifier	Agilent	8447D	RE	2005/09/07 * 12
MAT-07	Attenuator(6dB)	Weinschel Corp	2	RE	2005/12/16 * 12
MCC-12	Coaxial Cable	Fujikura/Agilent	-	RE	2006/02/23 * 12
MAEC-02	Anechoic Chamber	TDK	Semi Anechoic Chamber 3m	RE	2006/04/10 * 12
MOS-02	Digital Humidity Indicator	N.T	NT-1800	RE/CE	2004/11/25 * 24
MLS-07	LISN(AMN)	Schwarzbeck	NSLK8127	CE (EUT)	2006/02/06 * 12
MTR-03	Test Receiver	Rohde & Schwarz	ESCI	RE / CE	2006/03/04 * 12
MSTW-14	EMI measurement program	TSJ	TEPTO-DV	RE	-

All equipment is calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

Test Item:

CE: Conducted emission

RE: Radiated emission

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APPENDIX 3: Data of EMI test

Conducted Emission

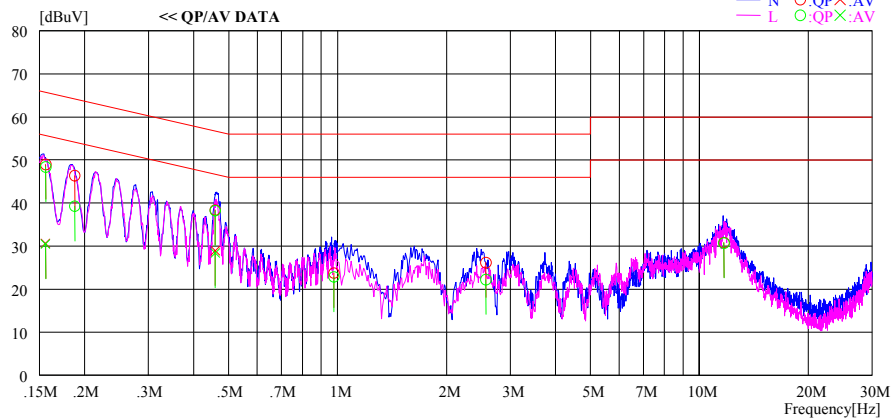
DATA OF CONDUCTED EMISSION TEST

UL Apex Co., Ltd. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2006/04/11 18:40:45

Company : Hitachi Maxell, Ltd. Report No. : 26HE0100-HO
Kind of EUT : Digital Pen Power : AC120V / 60Hz (AC Adaptor DC 5.0V)
Model No. : DP-201 Temp./Humi. : 25deg. C / 51%
Serial No. : AJX-AAB-H2Z-AE Operator : Makoto Kosaka

Mode / Remarks : Charging (DP-201 + PS-DP1)

LIMIT : FCC15B ClassB (QP) (0.15~30MHz) / ICES-003
FCC15B ClassB (AV) (0.15~30MHz) / ICES-003



Frequency [MHz]	Reading Level		Corr. Factor	Results		Limit		Margin		Phase
	QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dB]	AV [dB]	
0.15590	48.8	30.4	0.2	49.0	30.6	65.7	55.7	16.7	25.1	N
0.18780	46.2	---	0.2	46.4	---	64.1	---	17.7	---	N
0.45940	38.0	28.5	0.4	38.4	28.9	56.7	46.7	18.3	17.8	N
0.97700	23.4	---	0.4	23.8	---	56.0	---	32.2	---	N
2.56500	25.6	---	0.6	26.2	---	56.0	---	29.8	---	N
11.68300	29.3	---	1.5	30.8	---	60.0	---	29.2	---	N
0.15590	48.2	30.3	0.2	48.4	30.5	65.7	55.7	17.3	25.2	L
0.18780	39.1	---	0.2	39.3	---	64.1	---	24.8	---	L
0.45940	37.8	28.0	0.4	38.2	28.4	56.7	46.7	18.5	18.3	L
0.97700	22.5	---	0.4	22.9	---	56.0	---	33.1	---	L
2.56500	21.6	---	0.6	22.2	---	56.0	---	33.8	---	L
11.68300	29.2	---	1.5	30.7	---	60.0	---	29.3	---	L

CHART: WITH FACTOR, Peak hold data. Data is uncorrected. CALCULATION: RESULT=READING+C.F (L1SN LOSS+CABLE LOSS)
Except for the above table : adequate margin data below the limits.

Radiated Emission

DATA OF RADIATED EMISSION TEST

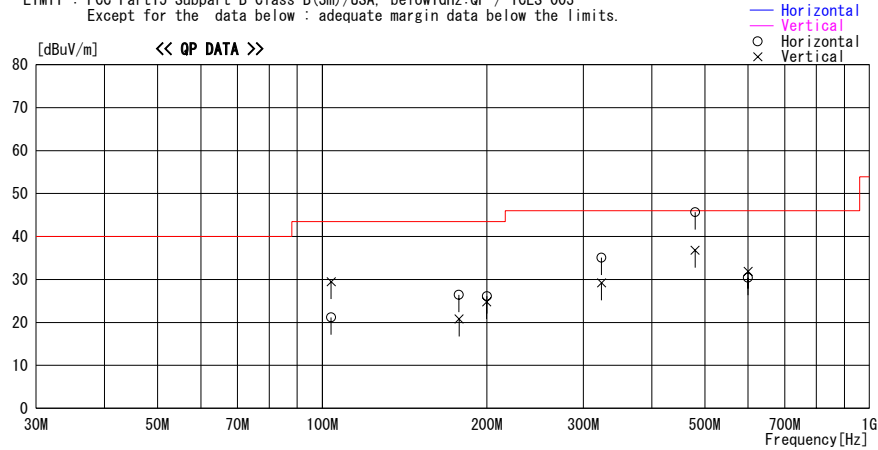
UL Apex Co., Ltd. Head Office EMC Lab. No.2 Semi Anechoic Chamber
Date : 2006/03/18 01:01:55

Company : Hitachi Maxell, Ltd.
Kind of EUT : Digital Pen
Model No. : DP-201
Serial No. : AJX-AAB-H2Z-AE

Report No. : 26HE0100-H0
Power : DC 5.0V
Temp./Humi. : 21deg.C. / 34%
Operator : Yutaka Yoshida

Mode / Remarks : BT Communication / Max-axis (Hor:Z,Ver:Y)

LIMIT : FCC Part15 Subpart B Class B(3m)/USA, below1GHz:QP / ICES-003
Except for the data below : adequate margin data below the limits.



Frequency	Reading	DET	Antenna		Level	Angle	Height	Polar.	Limit	Margin	Comment
			Factor	Gain							
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]	[Deg]	[cm]		[dBuV/m]	[dB]	
103.858	40.4	QP	10.4	-21.3	29.5	360	100	Vert.	43.5	14.0	
103.869	32.1	QP	10.4	-21.3	21.2	353	317	Hori.	43.5	22.3	
177.801	25.4	QP	15.9	-20.5	20.8	149	100	Vert.	43.5	22.7	
177.585	31.0	QP	15.9	-20.5	26.4	109	268	Hori.	43.5	17.1	
199.736	28.2	QP	16.6	-20.0	24.8	222	114	Vert.	43.5	18.7	
199.925	29.5	QP	16.6	-20.0	26.1	81	100	Hori.	43.5	17.4	
323.999	32.5	QP	15.1	-18.4	29.2	209	146	Vert.	46.0	16.8	
323.998	38.4	QP	15.1	-18.4	35.1	284	100	Hori.	46.0	10.9	
479.968	47.6	QP	17.8	-19.7	45.7	343	100	Hori.	46.0	0.3	
479.967	38.7	QP	17.8	-19.7	36.8	182	115	Vert.	46.0	9.2	
599.805	31.9	QP	19.2	-19.2	31.9	305	100	Vert.	46.0	14.1	
599.380	30.5	QP	19.2	-19.3	30.4	19	169	Hori.	46.0	15.6	

CHART:WITH FACTOR ANT TYPE : -30MHz LOOP, 30-300MHz BICONICAL, 300MHz-1000MHz LOGPERIODIC, 1000MHz- HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS(CABLE+ATTEN.) - GAIN(AMP)

Radiated Emission

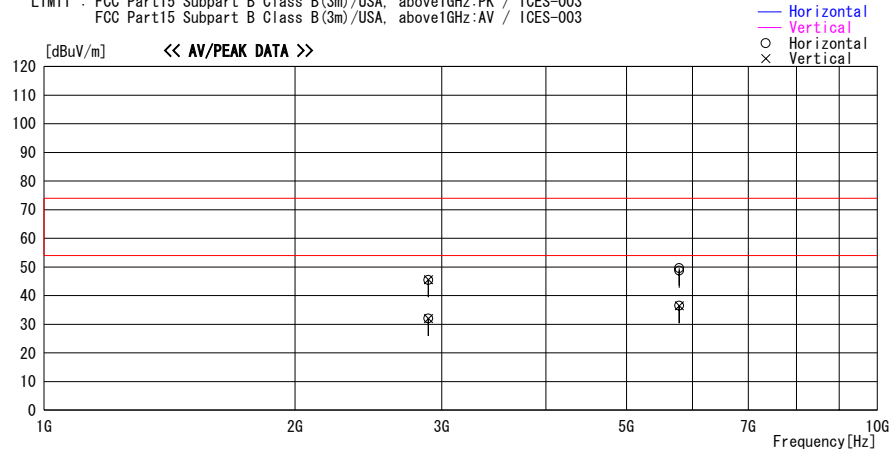
DATA OF RADIATED EMISSION TEST

UL Apex Co., Ltd. Head Office EMC Lab. No. 2 Semi Anechoic Chamber
Date : 2006/03/17 23:20:12

Company : Hitachi Maxell, Ltd.
Kind of EUT : Digital Pen
Model No. : DP-201
Serial No. : AJX-AAB-H2Z-AE
Report No. : 26HE0100-HO
Power : DC 5.0V
Temp./Humi. : 21deg.C. / 34%
Operator : Yutaka Yoshida

Mode / Remarks : BT Communication / Max-axis (Hor:Z,Ver:Y)

LIMIT : FCC Part15 Subpart B Class B(3m)/USA, above1GHz:PK / ICES-003
FCC Part15 Subpart B Class B(3m)/USA, above1GHz:AV / ICES-003



Frequency	Reading	DET	Antenna	Loss&	Level	Polar.	Limit	Margin
			Factor	Gain				
[MHz]	[dBuV]		[dB/m]	[dB]	[dBuV/m]		[dBuV/m]	[dB]
2892.000	42.2	PK	31.6	-28.4	45.4	Hori.	73.9	28.5
2892.000	42.4	PK	31.6	-28.4	45.6	Vert.	73.9	28.4
2892.000	28.9	AV	31.6	-28.4	32.1	Hori.	53.9	21.8
2892.000	28.8	AV	31.6	-28.4	32.0	Vert.	53.9	21.9
5780.000	38.8	PK	36.6	-26.6	48.8	Hori.	73.9	25.2
5780.000	39.6	PK	36.6	-26.6	49.6	Hori.	73.9	24.3
5780.000	26.4	AV	36.6	-26.6	36.4	Hori.	53.9	17.5
5785.000	26.4	AV	36.6	-26.6	36.4	Vert.	53.9	17.5

CHART:WITH FACTOR ANT TYPE : -30MHz- LOOP, 30-300MHz BICONICAL, 300MHz-1000MHz LOGPERIODIC, 1000MHz- HORN
CALCULATION:RESULT = READING + ANT FACTOR + LOSS(CABLE+ATTEN.) - GAIN(AMP)